

with sparse innate coronary collateral vessels similar to those in humans, certain interventions can promote coronary collateral artery development and potentially protect ischemic myocardium by salvaging tissue in the jeopardized zone and reducing infarct size.

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REFERENCES

- Bloor CM, White FC: Approaches to the containment of myocardial-infarct size following coronary-vessel occlusion, chap 26, *In* Kalsner S (Ed): *The Coronary Artery*. New York, Oxford University Press, 1982, pp 685-706
- Bloor CM, White FC, Sanders TM: Effects of exercise on collateral development in myocardial ischemia in pigs. *J Appl Physiol* 1984 Mar; 56:656-665
- Lammers RJ, White FC, Bloor CM: Coronary collateral development in a model with sparse innate collaterals. *Lab Invest* 1984 Jan; 50:33A

The Flow Cytometer in the Clinical Laboratory

FLOW CYTOMETRY involves passing a beam of laser light through a stream of cells and then analyzing the scattered light in relation to the number of cells stained by one or more fluorescent probes. This technique has been used for at least ten years in research laboratories to separate out specific cell populations and to analyze cells and cell populations with respect to surface antibody staining or DNA staining or both.

There are significant advantages to the use of the flow cytometer. Fluorescence microscopy seldom allows for the quantitative measurement of the staining properties of each individual cell, and becomes a very laborious process if more than a few hundred cells are to be analyzed. In addition, bulk measurements of collections of cells give average results for the overall population and do not really delineate possible subpopulations that often exist in lymphomas, for example. Flow cytometry, on the other hand, allows for the rapid and quantitative measurement of thousands of cells and multiple properties of each. For example, DNA content and cell size can be used as criteria for the detection of abnormal populations of malignant cells. It has been shown that hyperdiploid cells can easily be distinguished from their normal counterparts by determining both the size and the DNA content of the cells. Braylan and colleagues have recently used the simultaneous measurement of DNA content and surface markers to define abnormal cell populations in malignant lymphomas. Because malignant cells are capable of changing during the course of a disease, it is important not to rely solely on one method of identification.

The clinical applications of the flow cytometer are generally restricted at present to the analyses of lymphoma and leukemia lymphocytes. Future application may involve a determination of κ - to λ -chain ratios. The amount of each chain on the surface of normal lymphocytes is about equal, whereas in malignant cells, a change in the ratio of κ - to λ -chains is observed. Other applications will involve the detection of autoantibodies in autoimmune hemolytic anemia, neutropenia and immune thrombocytopenia. Of these potential uses, the

most developed at present is the detection of antibodies on platelets. Antiplatelet antibodies can be accurately measured in 1 ml of blood from a patient with a platelet count of 1,000 per μ l or less. This determination cannot be done by any of the other techniques currently used because of the significantly larger numbers of platelets required.

The primary drawback of this system is the cost. Most flow cytometers currently used for clinical applications cost in excess of \$100,000. For use in only a limited number of tests, most hospitals other than large centers for leukemia or lymphoma would have trouble justifying such a large capital expenditure. A problem specifically associated with such sophisticated equipment is that, in spite of attempts to simplify the mode of operation, a highly trained technician is needed to operate the machine because the likelihood of major breakdowns is quite high. In addition, the rate of cells passing through the machine cannot really be increased above 5,000 cells per second and this is relatively slow if one has to analyze a million cells to get reliable data. This is a serious drawback, and unless there is a basic change in technology, it will remain a major limiting factor.

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REFERENCES

- Ault KA: Clinical applications of fluorescence-activated cell sorting techniques. *Diagn Immunol* 1983; 1(1):2-10
- Barlogie B, Raber MN, Schumann J, et al: Flow cytometry in clinical cancer research. *Cancer Res* 1983 Sep; 43:3982-3997
- Braylan RC, Benson NA, Nourse V, et al: Correlated analysis of cellular DNA, membrane antigens and light scatter of human lymphoid cells. *Cytometry* 1982 Mar; 2:337-343
- Braylan RC, Diamond LW, Powell ML, et al: Percentage of cells in the S phase of the cell cycle in human lymphoma determined by flow cytometry. *Cytometry* 1980 Nov; 1:171-174

Current Trends in Drug Overdose

DRUG AVAILABILITY, price and current fads are mainly responsible for changing trends in drug intoxication. In Los Angeles, phencyclidine hydrochloride (PCP) is widely available, relatively cheap and the most popular drug of abuse. The incidence of admissions to hospital for PCP intoxication is correspondingly high. Four PCP analogues with effects similar to PCP are available on the streets.

Cocaine use is rampant, and cases of severe cocaine poisoning are appearing sporadically. Some patients who die in status epilepticus have a ruptured package of cocaine in the bowel at autopsy.

Heroin, a perennial favorite, is presently abundant and down in price. Intravenous injection of heroin mixed with cocaine (a "speed ball") is an old combination regaining its popularity. A new fad is "smoking" heroin by heating it on a piece of aluminum foil and inhaling the vapors. As the drug volatilizes the particles "jump around" on the foil. This practice is called "chasing the dragon." The most popular narcotic appears to be codeine, usually taken in tablets containing either aspirin or acetaminophen. Acetaminophen intoxication remains a common problem.

Two drugs of the 1960s, glutethimide and LSD (lysergic acid diethylamide), have returned. Glutethi-